

US008119011B1

(12) United States Patent

Nyman et al.

(10) **Patent No.:**

US 8,119,011 B1

(45) **Date of Patent:**

Feb. 21, 2012

(54) OPTIMIZED ALUMINA COAGULANTS FOR WATER TREATMENT

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(*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 540 days.

(21) Appl. No.: 12/369,042

(22) Filed: Feb. 11, 2009

(51) **Int. Cl.** *C02F 1/52*

(2006.01) (2006.01)

C02F 1/56 (2006.01) (52) U.S. Cl. 210/725; 210/716; 210/723; 210/724; 210/727; 210/737; 252/175

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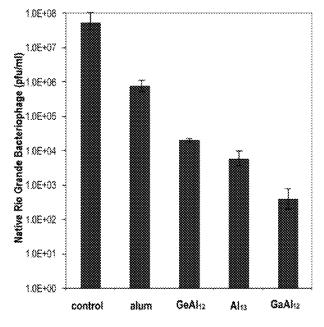
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(57) ABSTRACT

Substitution of a single Ga-atom or single Ge-atom (GaAl $_{12}$ and GeAl $_{12}$ respectively) into the center of an aluminum Keggin polycation (Al $_{13}$) produces an optimal water-treatment product for neutralization and coagulation of anionic contaminants in water. GaAl $_{12}$ consistently shows ~1 order of magnitude increase in pathogen reduction, compared to Al $_{13}$. At a concentration of 2 ppm, GaAl $_{12}$ performs equivalently to 40 ppm alum, removing ~90% of the dissolved organic material. The substituted GaAl $_{12}$ product also offers extended shelf-life and consistent performance. We also synthesized a related polyaluminum chloride compound made of pre-hydrolyzed dissolved alumina clusters of [GaO $_4$ Al $_{12}$ (OH) $_{24}$ (H $_2$ O) $_{12}$] $^{7+}$.

19 Claims, 5 Drawing Sheets



Aluminum coagulant (10 mg/L Al dose)